Zero Retries
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Linking - How to get from here to there in one piece.

Well, it is now my turn to share some of my thoughts on linking. As of now we operate on mainly one 2 meter frequency. If we were to expand nearby hill top digipeaters on this same frequency to allow interconnecting to other areas this will compound our problems rather than help. Local traffic in nearby areas would interfere with each other because the hill tops could hear one another. The system would come to a grinding halt with one file transfer. What is the solution to this? It is to get the linking traffic off of a user LAN frequency. This is done by transfering the traffic to a linking LAN on another frequency of its own where similar nearby linking stations are operating. This article will propose a method to implement the linking station and LAN.

Level 3 controllers are not now available and will not be for some years. What are other parts of the country considering for linking hardware? It is called a multiport digipeater. It sits on the user LAN and the linking LAN frequencies. Simply, it will route your packet to, from, and thru the linking LAN depending on the digipeater address field. It requires you to know the specific routing. This all takes place at level 2. Therefore, ACKs will return thru the linking LAN.

The multiport digipeater design I am proposing is based on software originally written for the surplus Xerox 820-1 computer board. Normally you would connect a keyboard, monitor, and disk drives to it to make it function as a computer. These are not required. The board has two 2k byte EPROMs that are used to boot the operating system from disk, etc. These are replaced with ones that contain the code to make the board function as a two-port digipeater. The board has two serial ports that are connected to an external dual EPROM based state machine adapter card that encodes and decodes the Non Return to Zero Inverted (NRZI) modulation method required for packet. This is simply two 2k byte EPROMs and four other common chips. This software and state machine EPROM code were designed by Jon Bloom, KE3Z.

One serial channel would be connected to a 1200 baud 1200/2200 Hz AFSK modem. This in turn connects to a radio mic and speaker as we do now with our own TNC for normal user access. This could be on any frequency of choice. The other serial channel would be connected, for example, to a 9600 baud RF modem (frequency shift keying) that would be on the linking LAN frequency. This 9600 baud RF modem could be based on the Steve Goode, K9NG, design that uses a modified Hamtronics FM-5 220 MHz tranceiver with an adapter board. The frequencies being considered around the country are between 220.5 and 221.0 MHz, i.e. 220.95 MHz, 100 KHz wide coordinated channel for future baud rate expansion. The choice of linking LAN baud rate is software selectable and would depend on availability of modem/radio equipment. If a 9600 baud radio modem is unavailable, then a 1200 baud modem and radio could be used.

The following is an extract from the multiport digipeater software documentation on how it determines the routing of each packet (frame) :

Frames can be received on any channel and retransmitted on another channel or the same channel. When a frame is received, the program will examine the address field to determine the retransmission channel for that frame. There are three ways in which a retransmission channel can be specified, listed in order of priority:

1) Next repeater address - If the next repeater address following the

address of this repeater is found in a table of repeaters for a given channel, the frame will be retransmitted on that this digipeater.)

2) Default SSID - If the next repeater address following the address of this repeater has the default SSID for a given channel, the frame will be retransmitted on that channel. (This could be an agreed upon SSID for digipeaters on the linking LAN. This would allow new digipeaters to be used on the linking LAN until their call could be added to the list in the program.)

3) Destination station - If the frame has been fully repeated (this repeater is the last repeater address) and the destination address is found in a table of destination addresses for a given channel, the frame will be retransmitted on that channel. (This could be a level 3 controller within range of this digipeater on the linking LAN.)

Failing resolution of the destination channel by the above rules, the frame will be retransmitted on the default transmission channel for that reception channel. The default transmission channel may be the same as the reception channel, in which case the repeater will appear as a one-port machine to that frame.

The software allows for many routing possibilities. The whole program is contained in EPROM along with the site specific data. It could easily be ex panded to more than two ports if other than the Xerox 820-1 computer board was used.

If each of our LANs were equipped with a two-port digipeater then traffic could pass between them with a minimum of two digipeaters in the address. As LANs are established farther apart they could still be interconnected by using intermediate digipeaters on the linking LAN. This is in keeping with the goal to get the linking traffic off of a user LAN frequency.

This approach will not be thrown away when a level 3 machine arrives. I cannot imagine an expensive level 3 controller being placed on a hill top. It will need to be linked to adjacent level 3 machines via this linking LAN. This approach is laid out in a building block approach. Other linking LAN digipeaters can be added and subtracted as needed. It is an adaptable linking method. The individual subassemblies, i.e. multiport digipeater, modems and/or radios, could be unplugged and upgraded as required.

The cost of a surplus Xerox 820-1 board with matching ac power supply is about $100. They may be scarce. If we decide to go this route then we should consider acquiring enough boards to meet our future needs. Also, required is a dual NRZI state machine adapter card that would cost about $25 to build. Failing this, we could build up an equivalent board including the NRZI state machine able to operate from 12 VDC for the same price or less. (I am working on a schematic for such an equivalent board.) The software is written in a structured manner with good comments that can easily be modified to work with it. The estimated cost to build a 1200 baud modem and the 9600 baud modem adapter completely from scratch is about $50. The going price of the Hamtronics FM-5 radio is about $150. The only other items would be a user LAN radio, antennas and coax for each LAN, 12 VDC power supply, cabinets, etc. So, for the price of two TNCs we could have most of what we need for each linking site. This linking method is being pursued in southern California as an upgrade to their portion of Westnet.

As usual, I invite you to shoot holes in my proposal. Remember, it will take money, time, and people to make any approach to linking work. Also, keep in mind that the first requirement for good linking is hill top sites. So, have at it!

From that little old linking lunatic, Dennis Goodwin, KB7DZ.

PACKET RADIO AND HAMFAIR

NAPRA will be joining the efforts the Radio Club of Tacoma this August by providing three presentations for the Tacoma Hamfair on August 17th and 18th.

Tom Hogan, WB7DCH, will offer a packet primer entitled: "Why Packet?" Budd Churchward, WB7FHC, will offer an advanced seminar for people familiar with packet entitle: "Packet Radio: Its problems and their solutions." Both of these presentations were well received earlier this year at the Seaside Hamfest in Oregon. Tom and Budd are both members of the Board of Directors of NAPRA. Tom operates a mailbox on the 145.01 LAN and Budd runs one on the 220 LAN.

In addition to these presentations, Harold Price, NK6K, make a packet presentation on packet radio and on amateur satellites.

Harold Price, NK6K, was first licensed in 1972. He has been a strong advocate of Packet Radio in the Amateur Radio Service for several years, and is the author of many articles and papers on the subject. He is co-author of the software for the Tucson Amateur Packet Radio TNC and is on the board of directors of the TAPR corporation.

Harold is project manager of the PACSAT packet radio satellite now under development by the Radio Amateur Satellite Corporation (AMSAT) and Volunteers in Technical Assistance (VITA). He is one of the principal investigators on the Digital Communications Experiment onboard UoSat-Oscar 11 spacecraft. His professional background is in Computer Science, he holds a B.S. degree in that field.

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DCH... At Large

"If you're not a part of the solution...
then you must be a part of the problem."

As Director-At-Large, and as SYSOP of the MailBox, I get to talk to an awful lot of packet operators. I'm hearing some things which really distress me. The first thing I'm hearing is that people are not leaving their stations on during the times they're not actually operating. A number of these same people will complain to me that they can't always find a path to get into the MailBox. Has it occurred to you nice folks that maybe the reason you can't find a path is that some other operator turns HIS equipment off when he's not operating?

How do you think packet radio operates in areas where they don't have three nice high digipeaters? Let me tell you. Packet radio works because people all leave their equipment on 24 hours a day in those areas. Even after we get the Backbone in place and Level 3 operational, there will still be locations requiring a hop or two to get into the Link Management Units. We have been hearing grumbling in the ranks ever since some of the folks moved over to the 224.56 MHz LAN. Now that we have high-level digipeaters on both 147.60 MHz (WB6VAC-0) and 145.01 MHz (WN7ANK-5), a lot of folks are complaining that they can't find Good 'Ol Joe anymore, and even if they could find him, they couldn't get to him because Good 'Ol Reliable Sam who they used to digipeat through has moved to another LAN.

Packet radio is a new experimental mode which allows the average Ham to make a significant contribution to the state of the art in networking simply by leaving his equipment powered. If you only have your equipment powered when you're operating, your only contribution is QRM.

Another thing I hear a lot of is "When they get Level 3 ...", "When they get the new digi on the hill...", "When they get the HF GateWay built...". They? Who is this wonderful and all providing "They" that we're all waiting for? Could "They" be "We"? Don't you think that perhaps a few more of us ought to get off our duffs and lend a hand? waiting for?

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